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VLAHOS, SOPHIA	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/523,154	OLIVIERI, STEFANO	
	Examiner	Art Unit	
	SOPHIA VLAHOS	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 July 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments (received on 1/27/09) addressing the rejection of claims 1-7 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues (second paragraph, page 9 of "Remarks"):

"In contrast, in the present disclosure, and a recited in the amended independent Claims, the interleaving and puncturing are performed at two different rates so that the interleaving schemes do not depend on the rate of puncturing. Thus, interleaving and puncturing are performed at different variable rates with respect to each other so that one function does not depend on the other function, as recited in the amended Claims of the present disclosure. Support for such a feature can be found at least at page 2, lines 23-25, page 3, lines 1-2, and page 7, lines 16-20 of the present disclosure..."

Examiner Response

The cited portions of Applicant's disclosure, disclose that an interleaving scheme does not depend on a rate of puncturing and the interleaving scheme does not depend on the coding rate selected by coding rate control unit 17 (which essentially controls the puncturing rate).

However, nowhere in the specification does Applicants disclosure recite "wherein the first variable rate of the interleaving is different than the second variable rate of the puncturing **so that** the interleaving and puncturing are operatively independent of each other." (emphasis added) It seems Applicant is trying to convey that Interleaving is

performed at a different rate than puncturing so that interleaving and puncturing functions are operatively independent from each other.

Interleaving refers to permutation of rows and columns (Tong et al., column 4, lines 38-59, and column 8, lines 31-65 example of the interleaving operation) whereas puncturing refers to deleting redundant data bits (column 9, lines 1-17). Interleaving and puncturing are operatively independent of each other, and in Tong et al. they have different rates (all 8 bits per column are interleaved whereas 2 bits per column are punctured). .

The reference to Tong et al. (U.S. 6,744,744) also discloses an interleaving function with 3 steps (column 4, lines 41-67), with a variable rate, as it at least depends on N_c and N_r and γ (the interleaving rate depends on the length of data bits)

Therefore, if Applicant considers the addressing A(i) and A(j) to comprise interleaving at a first variable rate, then Tong et al. also discloses interleaving at a first variable rate.

Regarding the puncturing operation, claim 1 has been amended so that it recites: (line 13) "...puncturing the interleaved parity symbols at a second variable rate..."¶0026 -0027 and Fig. 5 of Patent Application Publication of the instant application discloses puncturing controlled by a coding rate control unit.

The reference to Tong et al. also discloses variable puncturing rate (column 8, lines 23-26, the 20% maximum puncturing ratio).

For at least the above reasons, claims 1-7 are rejected under 35 U.S.C. 103(a)

Specification

2. The amendment to the specification was received on 1/27/09 and is acceptable.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 4 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 4 is rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. Supreme Court precedent[1] and recent Federal Circuit decisions[2] indicate that a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. While the instant claim(s) recite a series of steps or acts to be performed, the claim(s) neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process. Claim 4 recites the steps of "generating", "interleaving", "dynamically

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[1] *Diamond v. Diehr*, 450 U.S. 175, 184 (1981); *Parker v. Flook*, 437 U.S. 584, 588 n.9 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972); *Cochrane v. Deener*, 94 U.S. 780, 787-88 (1876).

[2] *In re Bilski*, 88 USPQ2d 1385 (Fed. Cir. 2008).

selecting" with no apparatus/apparatuses is/are recited in connection with the any of these steps. Hardware is not required in the performing of the steps and therefore is neither an explicitly recited structural tie nor inherently involved in the steps.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-7 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Independent claims 1, 4, 6, 7 recite: "wherein interleaving occurs at a first variable rate and puncturing occurs at a second variable rate, where the first and second variable rates are different so that the interleaving and the puncturing are operatively independent of each other." However, nowhere in the specification does Applicants disclosure recite "wherein the first variable rate of the interleaving is different than the second variable rate of the puncturing **so that** the interleaving and puncturing are operatively independent of each other." There is insufficient description in the

specification so as to enable one skilled in the art to which it pertains, or with which it is mostly connected, to make and/or use the invention.

Dependent claims 2-3, 5 are also rejected since they at least contain the limitations of the respective independent claims.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 6-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6, lines 12-14 recite: "wherein interleaving occurs at a first variable rate and puncturing occurs at a second variable rate, where the first and second variable rates are different so that the interleaving and the puncturing are operatively independent of each other." There is insufficient antecedent basis for this limitation in the claim, there is no previous recitation of "interleaving" in the claim.

Claim 7 also recites: "wherein interleaving occurs at a first variable rate and puncturing occurs at a second variable rate, where the first and second variable rates are different so that the interleaving and the puncturing are operatively independent of each other." There is insufficient antecedent basis for this limitation in the claim, there is no previous recitation of "interleaving" in the claim.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1, 3, 4 as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tong et al. (U.S. 6,744,744) in view of Dötsch et al. (U.S. 6,513,140) and Zhang (U.S. 6,968,494).

With respect to claim 1, Tong et al., disclose: an encoder for encoding information according to an error protecting code (Fig. 5, see combination of blocks 90, the channel interleavers, and rate matching "turbo encoder" see convolutional coders, column 10, lines 18-21); and a control unit for determining a coding rate that is to be used by the encoder (not shown in Fig. 3, circuit out of which "P/R" signal is generated determining whether repetition or puncturing is required in rate matching block 26 of Fig. 3, column 7, lines 65-67, column 8, lines 1-10, see column 3, lines 44-48, where the determined coding rate matches the data rate of the radio communications rate (depends on the available bandwidth), see also column 5, lines 14-26 and Fig. 5 where the puncturing performed by block 95 determines the coding rate), wherein the encoder comprises: an input for receiving information bits (Fig. 5, input data bits are supplied to the input of turbo coder, see column 10, lines 23-28); a parity bit generator for generating parity bits from the information bits (Fig. 5, see output of either encoder 1 P1 and/or encoder 2, P2, column 10, lines 23-28); and an interleaving and puncturing unit

(Fig. 5, channel interleavers and puncture block (also show in Fig. 3)) that interleaves at a first variable rate (column 4, lines 38-61, and example on column 8, lines 23-65, the interleaving rate depends on the number of Nr, Nc ,γ) the information bits and parity bits with a predetermined interleaving scheme for protection against burst errors in the transmission signal (column 10, lines 32-39, column 1, lines 53-55, where the interleaving protects against burst errors since it shuffles bits so that no single codeword is affected by burst noise and the receiver cannot decode it), the interleaving and puncturing unit puncturing the interleaved parity symbols at a second variable rate subsequent to said interleaving, puncturing being controlled by the determined coding rate (see "P/R" control signal in rate matcher 26 as shown in Fig. 3, and Fig. 5, see column 3, lines 45-46, column 5, lines 14-26, column 10, lines 44-55, where the puncturing is controlled by the "P/R" based on the determined coding rate that matches the data rate (air rate) and for the puncture rate see column 4, lines 21-25 the 20% maximum puncturing ratio corresponds to a puncturing variable rate).

Tong et al. do not expressly teach: a modulator for modulating information from the encoder in a transmission signal; symbols; dynamically selecting a coding rate; puncturing being controlled dynamically by the selected coding rate;

In the same field of endeavor (RF communications), Dötsch et al. disclose: a modulator for modulating information from the encoder in a transmission signal (see column 7, lines 13); symbols (Fig. 1 turbo encoder , input U comprises unencoded symbols and R1 and R2 are redundancy symbols see Fig. 2 and column 6, lines 18-67, through column 7, lines 19);

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify Tong et al. based on the teachings of Dötsch et al so that turbo encoding is performed on symbols (groups of bits). Also at the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify Tong et al. so that a modulator (is used) for modulating information from the encoder in a transmission signal, so that the information signal is modulated onto a property (frequency, phase, amplitude, polarization etc.) of a carrier signal i.e. the information signal is converted into a suitable format for transmission.

In the same field of endeavor (data communications), Zhang discloses: a control unit for dynamically selecting a coding rate that is to be used by the encoder (Fig. 1, block 110 adaptive controller selecting a coding rate of the puncture encoder block 112, see column 2, lines 45-55, column 3, lines 6-11, 44-64); puncturing being controlled dynamically by the selected coding rate (see column 2, lines 45-65, column 3, lines 44-64 where the puncturing is adaptive (dynamic) based on a channel quality measure).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify Tong et al. based on the teachings of Zhang so that an appropriate coding rate is selected based on a channel quality measure and a number of error correcting bits is adaptively adjusted (by control of the puncturing) in response to the channel quality measure to avoid unnecessary overhead for the receiver (Zhang column 1, lines 31-35).

With respect to claim 3, as best understood, Tong et al., disclose: wherein the parity symbol generator comprises a first convolution encoder (see Fig. 5, "encoder 1" block 92, see column 10, lines 23- 27) and a pre-encoding interleaver coupled to the input (Fig. 5, "interleaver" block 91) and a second convolution encoder cascaded after the pre-encoding interleaver (Fig. 5, "encoder 2" cascaded behind block 91), the interleaving and puncturing unit comprising a first post encoding interleaver, coupled to interleave the information symbols and an output of the first convolution encoder (Fig. 5, circuit portion comprising channel interleavers 93 for S and P1 corresponds to the claimed first post encoding interleaver), and a second post-encoding interleaver coupled to interleave an output of the second convolution encoder (Fig. 5, block 93 interleaver of P2), separate from the first post encoding interleaver.

Method claim 4 is rejected based on a rationale similar to the one used to reject claim apparatus 1 above.

10. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tong et al. (U.S. 6,744,744) in view of Dötsch et al. (U.S. 6,513,140) and Zhang (U.S. 6,968,494) as applied to claims 1 & 5 above, and further in view of Farrell et al. (U.S. 6,643,331).

With respect to claim 2, Tong et al. Dötsch et al. and Zhang disclose: wherein the interleaving and puncturing unit comprises an interleaving memory (Fig. 3 see working

memory 50), the parity symbol generator outputting the parity symbols into a first port of the interleaving memory (Fig. 3, see input to memory 50, linear addressed write-in column 6, lines 15-17, column 10, lines 31-35 where the channel interleavers (for the P1, P2 parity symbols, where a memory is understood to have an input (a first port) where information is supplied to for storage) function as the one shown in detail in Fig. 3); a subset of the generated and stored parity symbols being mapped to the modulation symbols (Fig. 3 of Tong et al. shows interleaving followed by puncturing (of interleaved data in the FIFO memory 65) since puncturing deletes data (symbols(the punctured output 76 supplied to a modulator only includes a subset of the generated and stored data (of working memory 50)) a size of the subset being controlled dynamically by the selected coding rate (Fig. 3, "P/R" control signal supplied to selector 66 determines whether puncturing takes place dynamically in response to channel quality measure as taught by Zhang).

Tong et al. Dötsch et al. and Zhang do not expressly teach: the modulator mapping the parity symbols to positions in modulation symbols according to the locations at which the parity symbols have been written into memory; reading and mapping being coordinated to result in interleaving of at least the parity symbols so that parity symbols and information symbols, normally associated with the same modulation symbol, are distributed over mutually separated modulation symbols; the subset being defined by selecting the locations that are mapped to positions in the modulation symbols.

In the same field of endeavor, Farrell et al. disclose: the modulator mapping the parity symbols to positions in modulation symbols (Fig. 3 through Fig 5 showing turbo encoder, its associated buffer and the mapping to modulation (constellation) symbols, see column 3, lines 1-65).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Tong et al. Dötsch et al. and Zhang based on the teachings of Farrell et al., so that the modulator maps the parity symbols to positions in modulation symbols according to the locations at which the parity symbols have been written into memory the rationale being the modulation symbols comprise parity symbols (and information symbols as taught by Farrell). The symbol mapping is therefore clearly dependent on the initial supplying and writing of the symbols in the memory and the reading (that creates the interleaved symbols) as taught by Tong et al., as part of the process of mapping interleaved symbols into modulation symbols.

With respect to the limitations, reading and mapping being coordinated to result in interleaving of at least the parity symbols so that related parity symbols and information symbols are mutually separated modulation symbols; the subset being defined by selecting the locations that are mapped to positions in the modulation symbols., the system obtained by modifying Tong et al. Dötsch et al. and Zhang based on Farrell et al, discloses the above limitations. See that interleaving is applied to information and parity symbols (Fig. 5 of Tong et al.) and the modulator such as the one taught by Farrell e. al., creates modulation symbols using information and parity pairs (Table 1 on column 3) with related parity symbols and information symbols distributed

over mutually separated modulation symbols (see Table 1 of Farrell where information/parity (d1p1 & d2q2) are paired to create constellation points which are mutually spaced apart (distributed over mutually separated modulation symbols or constellation points)). Finally with respect to the subset being defined by selecting the locations that are mapped to positions in the modulation symbols, the subset referring to the subset of parity symbols (since the generated parity symbols are punctured, therefore a subset remains after puncturing) see column 8, lines 8-10 of Tong et al., where the punctured symbols are supplied to a buffer, and it is understood that the modulator accesses (selects) the buffer locations to generate the modulation symbols.

Claim 5 is rejected based on a rationale similar to the one used to reject claim 2 above.

11. Claims 6-7 as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiu et al. (U.S. 6,798,826) in view of Abe (U.S. 6,272,123) and Tong et al. (U.S. 6,744,744).

With respect to claim 6, Shiu et al. disclose: a demodulator for demodulating information from a transmission signal (Fig. 1, part of block 134, column 3, lines 47-53); ; a de-interleaver comprising a memory (Fig. 8 buffer 822, (Fig. 8 comprises blocks 822, 824, column 16, lines 14-18), the de-interleaver writing the demodulated information into the memory according to a coding rate independent address scheme (column 17, table erasure insertion algorithm, is coding rate independent , skipping locations for

parity bits that a control unit indicates to have been suppressed by puncturing (column 17, lines 13-50, where writing erasures in the memory in the place of punctured bits is equivalent to skipping locations for punctured parity bits, column 17, lines 15-45 shows that the erasure insertion algorithm is code rate independent and Fig. 11 shows blocks controller 1130 and address generator 1130 implementing the de-interleaving process, column21, lines 64-67, column 22, lines 1-3);

Shiu et al. do not expressly teach: a control unit for dynamically indicating a coding rate that has been used for encoding the transmission signal; determining an error correction unit for correcting errors in the demodulated information, the error correction unit being arranged to read the demodulated information from the memory in de-interleaved terms; wherein interleaving occurs at a first variable rate and puncturing occurs at a second variable rate, where the first and second variable rates are different so that the interleaving and the puncturing are operatively independent of each other.

In the same field of endeavor, Abe discloses: a control unit for dynamically indicating a coding rate that has been used for encoding the transmission signal (Fig. 2, block 40 is a controller and information on line 63 (the line connected to blocks 57-58), dynamically indicates a coding rate that has been used for encoding the transmission signal, see column 8, lines 34-37 where the dynamic selection of error correcting decoder 57 or 58 by controller 40 corresponds to dynamically indicating a coding rate used at the transmitter since these decoders undo the encoding operation performed by error correcting encoders 42, 44 which have different encoding rates and one of them is selected to encode the transmission of data at a time, column 7, lines 18-23, 40-45,

column 8, lines 20-26, 37-41, 47-53); determining an error correction unit for correcting errors in the demodulated information (Fig. 2 selection of one of the error correcting decoders by controller 40, column 8, lines 38-41), the error correction unit being arranged to read the demodulated information from the de-interleaver in de-interleaved terms (column 8, lines 30-38, the error correction unit receives (and read in order to decode) demodulated information (demodulation is a function of the RF receiving stage 21, column 5, lines 13-15) in de-interleaved (and punctured terms)).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Shiu et al. based on the teachings of Abe, so that bit sequences of higher importance are encoded using an error encoder with higher redundancy and at the receiver, the corresponding error correcting decoder is dynamically selected (based on coding rate information)(Abe, column 7, lines 32-45, column 8, lines 34-38).

With respect to the error correction unit being arranged to read the demodulated information from the memory in de-interleaved terms, see that the combination of Shiu et al. and Abe discloses the above limitation, since Shiu et al. shows that the de-interleaver comprises a memory (buffer) the contents of which are read by the error correcting decoder taught by Abe.

In the same field of endeavor, Tong et al. disclose wherein interleaving occurs at a first variable rate and puncturing occurs at a second variable rate, where the first and second variable rates are different so that the interleaving and the puncturing are operatively independent of each other (for interleaving see column 4, lines 40-60, and

example column 8, lines 23-65, maximum puncturing ratio of 20%, variable interleaving rate where all of the bits in the block are interleaved whereas 2 of the bits in the blocks are punctured).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Shiu et al. and Abe et al. based on Tong et al. so that puncturing and interleaving are interleaving shuffles all bits whereas puncturing only deletes up to 20% of bits in the blocks (Tong et al. column 4, lines 15-26).

Claim 7 is rejected based on a rationale similar to the one used to reject apparatus claim 6 above.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SOPHIA VLAHOS whose telephone number is (571)272-5507. The examiner can normally be reached on MTWRF 8:30-17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SOPHIA VLAHOS/
Examiner, Art Unit 2611
2/23/2009

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